

e Johansson, Eric B./in

E1	1	JOHANSSON, ELISABET/IN
E2	1	JOHANSSON, ELOF/IN
E3	20 -->	JOHANSSON, ERIC B/IN
E4	1	JOHANSSON, ERIC G B/IN
E5	1	JOHANSSON, ERIC H JR/IN
E6	1	JOHANSSON, ERIC T/IN
E7	1	JOHANSSON, ERIK/IN
E8	1	JOHANSSON, ERIK GUNNAR/IN
E9	1	JOHANSSON, ERIK I/IN
E10	1	JOHANSSON, ERIK K G/IN
E11	4	JOHANSSON, ERIK KARL GUSTAV/IN
E12	1	JOHANSSON, ERIK LENNART/IN

=> s e3

L1 20 "JOHANSSON, ERIC B"/IN

=> d 11 1-20

1. 5,130,083, Jul. 14, 1992, Hydride resistant spacer formed from interlocking strips; **Eric B. Johansson**, 376/441, 438, 442, 462 [IMAGE AVAILABLE]

2. 5,089,221, Feb. 18, 1992, Composite spacer with Inconel grid and Zircaloy band; **Eric B. Johansson**, et al., 376/442, 438, 441, 448, 453 [IMAGE AVAILABLE]

3. RE 33,818, Feb. 11, 1992, Axially shaped channel and integral flow trippers; Russell L. Crowther, Jr. deceased, et al., 376/443, 439, 444, 448 [IMAGE AVAILABLE]

20 NOV 92 14:48:27 U.S. Patent & Trademark Office P0002

4. 5,085,827, Feb. 4, 1992, Nuclear fuel assembly spacer and loop spring with enhanced flexibility; **Eric B. Johansson**, et al., 376/444, 434, 438, 441, 448 [IMAGE AVAILABLE]

5. 5,078,961, Jan. 7, 1992, Self locating springs for ferrule spacer; **Eric B. Johansson**, et al., 376/448, 434, 439, 441, 443 [IMAGE AVAILABLE]

6. 5,069,864, Dec. 3, 1991, Nuclear fuel assembly spacer and spring; **Eric B. Johansson**, 376/441, 438, 442 [IMAGE AVAILABLE]

7. 5,032,351, Jul. 16, 1991, Modified cross point spacer apparatus and construction; **Eric B. Johansson**, 376/438, 434, 442, 448; 976/DIG.81 [IMAGE AVAILABLE]

8. 5,002,726, Mar. 26, 1991, Nuclear fuel assembly spacer and loop spring with enhanced flexibility; **Eric B. Johansson**, 376/448, 444 [IMAGE AVAILABLE]

9. 4,999,153, Mar. 12, 1991, Flow tripper in combination with spacer deflector; **Eric B. Johansson**, et al., 376/443, 439, 444, 448 [IMAGE AVAILABLE]

10. 4,997,621, Mar. 5, 1991, Lower tie plate with stepped holes to

control pressure drop and flow distribution; **Eric B. Johansson**, et al., 376/444, 443, 445 [IMAGE AVAILABLE]

11. 4,963,318, Oct. 16, 1990, Spring lock washer for tie rod nuts; **Eric B. Johansson**, et al., 376/446, 434 [IMAGE AVAILABLE]

12. 4,913,875, Apr. 3, 1990, Swirl vanes integral with spacer grid;
20 NOV 92 14:48:43 U.S. Patent & Trademark Office P0003
Eric B. Johansson, et al., 376/439, 443; 976/DIG.60, DIG.75 [IMAGE AVAILABLE]

13. 4,889,684, Dec. 26, 1989, Hydraulic reinforcement of channel at lower tie-plate in BWR fuel bundle; **Eric B. Johansson**, 376/444, 203, 439, 443; 976/DIG.61 [IMAGE AVAILABLE]

14. 4,876,063, Oct. 24, 1989, Double-d water rod for 9 by 9 fuel bundle; **Eric B. Johansson**, 376/444, 439, 443; 976/DIG.60, DIG.64 [IMAGE AVAILABLE]

15. 4,871,509, Oct. 3, 1989, Fuel column retainer using radially compressed spring; **Eric B. Johansson**, 376/412, 418, 420, 451; 976/DIG.52 [IMAGE AVAILABLE]

16. 4,749,544, Jun. 7, 1988, Thin walled channel; Russell L. Crowther, et al., 376/443, 434, 439, 444, 448; 976/DIG.61 [IMAGE AVAILABLE]

17. 4,749,543, Jun. 7, 1988, Axially shaped channel and integral flow trippers; Russell L. Crowther, et al., 376/443, 439, 444, 448; 976/DIG.60, DIG.61 [IMAGE AVAILABLE]

18. 4,675,154, Jun. 23, 1987, Nuclear fuel assembly with large coolant conducting tube; Harold L. Nelson, et al., 376/444, 439, 443; 976/DIG.60 [IMAGE AVAILABLE]

19. 4,571,324, Feb. 18, 1986, Nuclear fuel assembly spacer; **Eric B. Johansson**, et al., 376/441, 438, 442; 976/DIG.73 [IMAGE AVAILABLE]

20. 4,129,477, Dec. 12, 1978, Axially alignable nuclear fuel pellets; **Eric B. Johansson**, et al., 376/429; 976/DIG.50 [IMAGE AVAILABLE]
20 NOV 92 14:48:58 U.S. Patent & Trademark Office P0004

=> s ll and (part?(p)rod# or short?(p)rod#)

1426717 PART?

282830 ROD#

103674 PART?(P)ROD#

578823 SHORT?

282830 ROD#

27580 SHORT?(P)ROD#

L2 18 L1 AND (PART?(P)ROD# OR SHORT?(P)ROD#)

=> d 4,292,128 acc

TEXT DATA FOR PATENT 4 IS NOT AVAILABLE, SEE THE MICROFILE OR PAPER INSTEAD

TEXT DATA FOR PATENT 292 IS NOT AVAILABLE, SEE THE MICROFILE OR PAPER INSTEAD

TEXT DATA FOR PATENT 128 IS NOT AVAILABLE, SEE THE MICROFILE OR PAPER

INSTEAD

=> d 4292128 acc

1. 4,292,128, Sep. 29, 1981, Boiling water type nuclear reactor; Renzo Takeda, et al., 376/370, 210, 267; 976/DIG.115 [IMAGE AVAILABLE]

=> s 12 and (spacer# or spacer(p)grid#)

84588 SPACER#

67135 SPACER

20 NOV 92 15:24:10

U.S. Patent & Trademark Office

P0005

41491 GRID#

1023 SPACER(P)GRID#

L3 15 L2 AND (SPACER# OR SPACER(P)GRID#)

=> s 13 and (spacer(p)lower and spacer#(p)upper)

67135 SPACER

928963 LOWER

16694 SPACER(P)LOWER

84588 SPACER#

660598 UPPER

21419 SPACER#(P)UPPER

L4 11 L3 AND (SPACER(P)LOWER AND SPACER#(P)UPPER)

=> s 14 and (spacer(a)pitch)

67135 SPACER

63076 PITCH

6 SPACER(A)PITCH

L5 1 L4 AND (SPACER(A)PITCH)

=> s 15 and (reduc? or minimiz? or decreas?)

930178 REDUC?

277443 MINIMIZ?

401275 DECREAS?

L6 1 L5 AND (REDUC? OR MINIMIZ? OR DECREAS?)

=> d 15

20 NOV 92 15:35:12

U.S. Patent & Trademark Office

P0006

'~RD' IS NOT A RECOGNIZED COMMAND

=> d 16

1. 5,032,351, Jul. 16, 1991, Modified cross point **spacer** apparatus and construction; **Eric B. Johansson**, 376/438, 434, 442, 448; 976/DIG.81 [IMAGE AVAILABLE]

=> d 16 kwic

US PAT NO: 5,032,351 [IMAGE AVAILABLE]

L6: 1 of 1

TITLE: Modified cross point **spacer** apparatus and construction

INVENTOR: **Eric B. Johansson**, San Jose, CA

ABSTRACT:

An improved **spacer** and method of making a **spacer** is disclosed for use in a nuclear fuel bundle wherein a plurality of fuel rods enclosed within a channel are maintained in parallel side-by-side relation by a

plurality of the **spacers**. Each **spacer** is placed within fuel bundle at selected elevations between **upper** and **lower** tie plates. The improved **spacer** is a member of the class of **spacers** wherein solid strips of material are welded at interstitially placed tube members between the fuel rods to form the continuous **spacer** **grid**. The improvement constitutes forming separate **upper** and **lower** **reduced** section **grids** from separate, normally aligned, first and second parallel sets of **grid** members. One **grid** is formed for the top of the **spacer**; the remaining **grid** is formed for the bottom of the **spacer**. Tube members placed interstitially between the fuel rods are used to interconnect the **grids**. The tube members themselves are in turn notched; the notches are at the **upper** portion of the tube members to receive the **upper** **grid** and at the **lower** portion of 20 NOV 92 15:36:48 U.S. Patent & Trademark Office P0007

US PAT NO: 5,032,351 [IMAGE AVAILABLE] L6: 1 of 1
the tube members to receive the **lower** **grid**. **Grids** are placed within the notched tube members and fastened, typically by welding to the top and bottom of t

=> s 376/439,443,444,371,373/CCLS and (short?(p)length(p)rod#)
106 376/439/CCLS
105 376/443/CCLS
106 376/444/CCLS
88 376/371/CCLS
23 376/373/CCLS
339 376/439,443,444,371,373/CCLS
(376/439 OR 376/443 OR 376/444 OR 376/371 OR 376/373)/CC

LS)
578823 SHORT?
673493 LENGTH
282830 ROD#
7391 SHORT?(P)LENGTH(P)ROD#
L2 21 376/439,443,444,371,373/CCLS AND (SHORT?(P)LENGTH(P)ROD#)

=> s l2 and (pressur? and critical(a)power or critical(a)heat)
707928 PRESSUR?
189164 CRITICAL
453011 POWER
146 CRITICAL(A)POWER
189164 CRITICAL
398176 HEAT
171 CRITICAL(A)HEAT
L3 6 L2 AND (PRESSUR? AND CRITICAL(A)POWER OR CRITICAL(A)HEAT)

=> s l3 and (deflect? or vane#)
137400 DEFLECT?
30500 VANE#
L4 1 L3 AND (DEFLECT? OR VANE#)

=> d l4

12:57:28 COPY AND CLEAR PAGE, PLEASE
1. 5,091,146, Feb. 25, 1992, Steam vent tube for BWR fuel assembly; Gary
E. Dix, **376/443**, **371**, 377 [IMAGE AVAILABLE]

=> s l2 and (deflect? or vane#)
137400 DEFLECT?
30500 VANE#
L5 7 L2 AND (DEFLECT? OR VANE#)

=> d l5 1-7

1. 5,130,082, Jul. 14, 1992, Low pressure drop gas-liquid separator;
Willem J. Oosterkamp, **376/371**, 377 [IMAGE AVAILABLE]

2. 5,100,609, Mar. 31, 1992, Enhancing load-following and/or spectral
shift capability in single-sparger natural circulation boiling water
reactors; Willem J. Oosterkamp, 376/210, 209, **373**, 377; 976/DIG.48,
DIG.136 [IMAGE AVAILABLE]

3. 5,091,146, Feb. 25, 1992, Steam vent tube for BWR fuel assembly; Gary
E. Dix, **376/443**, **371**, 377 [IMAGE AVAILABLE]

4. 5,085,826, Feb. 4, 1992, Steam dryer; Willem J. Oosterkamp,

.. **376/371**; 55/399; 376/377 [IMAGE AVAILABLE]

5. 4,947,485, Aug. 7, 1990, Method for obtaining load-following capability in natural circulation, free-surface separation boiling water reactors; Willem J. Oosterkamp, 376/210, 241, **371**, 377, 379; 976/DIG.195, DIG.302 [IMAGE AVAILABLE]

6. 4,762,669, Aug. 9, 1988, Nuclear reactor core containing fuel assemblies positioned adjacent core baffle structure having annular
12:58:39 COPY AND CLEAR PAGE, PLEASE
anti-vibration grids; Pratap K. Doshi, 376/442, **439**, **443**, 449; 976/DIG.78 [IMAGE AVAILABLE]

7. 3,979,257, Sep. 7, 1976, Boiling-water reactor; Diethelm Knodler, et al., 376/353, 225, **371**; 976/DIG.22, DIG.118 [IMAGE AVAILABLE]

=> d 13 1-6

1. 5,164,155, Nov. 17, 1992, Fuel bundle with **short** and intermediate part **length** **rods** minimized for flow induced vibration risk and **rod** bow; Richard A. Wolters, et al., 376/441, 370, 438, **439** [IMAGE AVAILABLE]

2. 5,091,146, Feb. 25, 1992, Steam vent tube for BWR fuel assembly; Gary E. Dix, **376/443**, **371**, 377 [IMAGE AVAILABLE]

3. 5,017,332, May 21, 1991, Two-phase **pressure** drop reduction BWR assembly design; Gary E. Dix, et al., 376/370, 377, 428, 435, **444** [IMAGE AVAILABLE]

4. 4,970,047, Nov. 13, 1990, Fuel assembly for nuclear reactors; Makoto Ueda, et al., **376/443**, **439**; 976/DIG.190 [IMAGE AVAILABLE]

5. 4,876,062, Oct. 24, 1989, Fuel assembly; Motoo Aoyama, et al., **376/444**, **443**, 447; 976/DIG.60 [IMAGE AVAILABLE]

6. 4,863,680, Sep. 5, 1989, Fuel assembly; Koichi Sakurada, et al., **376/444**, 438; 976/DIG.60, DIG.64 [IMAGE AVAILABLE]

=>

MS(1)
=> s (nuclear(a) reactor#)
40009 NUCLEAR
79984 REACTOR#
L7 8275 (NUCLEAR(A) REACTOR#)

=> s 17 and (part?(p) rod# or short?(p) rod#)
1426717 PART?
282830 ROD#
103674 PART?(P) ROD#
578823 SHORT?
282830 ROD#
27580 SHORT?(P) ROD#
L8 2387 L7 AND (PART?(P) ROD# OR SHORT?(P) ROD#)

=> s 18 and (spacer(p) pitch? or spacer(p) grid#(p) pitch?)
67135 SPACER
70069 PITCH?
743 SPACER(P) PITCH?
67135 SPACER
41491 GRID#
70069 PITCH?
25 SPACER(P) GRID#(P) PITCH?
20 NOV 92 16:15:51 U.S. Patent & Trademark Office P0023
L9 23 L8 AND (SPACER(P) PITCH? OR SPACER(P) GRID#(P) PITCH?)

=> s 19 and (upper(p) spacer# and lower(p) spacer#)
660598 UPPER
84588 SPACER#
21419 UPPER(P) SPACER#
928963 LOWER
84588 SPACER#
20968 LOWER(P) SPACER#
L10 16 L9 AND (UPPER(P) SPACER# AND LOWER(P) SPACER#)

=> s 19 and (pressur?)
'L1S' IS NOT VALID HERE

=> ds 19 and (pressur? and critical? or pressur?(p) dnb)
'DS' IS NOT A RECOGNIZED COMMAND

=> s 18 and (pressur?(p) critical? or pressur?(p) dnb or pressur?(p) film)
707928 PRESSUR?
195814 CRITICAL?
28532 PRESSUR?(P) CRITICAL?
707928 PRESSUR?
142 DNB
32 PRESSUR?(P) DNB
20 NOV 92 16:29:59 U.S. Patent & Trademark Office P0024
707928 PRESSUR?
213373 FILM
43882 PRESSUR?(P) FILM
L11 175 L8 AND (PRESSUR?(P) CRITICAL? OR PRESSUR?(P) DNB OR PRESSUR?(
P) F
ILM)

=> s l11 and (spacer#(p)pitch or spacer(p)grid(p)pitch?)

84588 SPACER#

70069 PITCH?

975 SPACER#(P)PITCH?

67135 SPACER

38918 GRID

70069 PITCH?

21 SPACER(P)GRID(P)PITCH?

L12 2 L11 AND (SPACER#(P)PITCH? OR SPACER(P)GRID(P)PITCH?)

=> d l12 1-2

1. 3,966,550, Jun. 29, 1976, Reactor fuel assemblies; Ronald B. Foulds, et al., 376/442, 445; 976/DIG.79 [IMAGE AVAILABLE]

2. 3,719,559, Mar. 6, 1973, FUEL PIN SPACER STRUCTURE; John C. Bass, 376/442; 976/DIG.65, DIG.73 [IMAGE AVAILABLE]

=> d l12 1-2

=> s l18 and (critical(p)power(p)pressur? or dnb(p)pressur?)

189164 CRITICAL

453011 POWER

707928 PRESSUR?

1444 CRITICAL(P)POWER(P)PRESSUR?

142 DNB

707928 PRESSUR?

32 DNB(P)PRESSUR?

L13 57 L18 AND (CRITICAL(P)POWER(P)PRESSUR? OR DNB(P)PRESSUR?)

=> s l13 and (spacer# or spacer(p)grid#)

84588 SPACER#

67135 SPACER

41491 GRID#

1023 SPACER(P)GRID#

L14 12 L13 AND (SPACER# OR SPACER(P)GRID#)

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P0027

=> s l14 and (spacer(p)pitch or vane# or deflect?)

67135 SPACER

63076 PITCH

690 SPACER(P)PITCH

30500 VANE#

137400 DEFLECT?

L15 6 L14 AND (SPACER(P)PITCH OR VANE# OR DEFLECT?)

=> d l15 1-6

1. 5,139,736, Aug. 18, 1992, Fuel assembly support grid; William J. Bryan, 376/442, 438, 439, 462 [IMAGE AVAILABLE]

2. 5,020,411, Jun. 4, 1991, Mobile assault logistic kinetmatic engagement device; Larry Rowan, 89/1.11; 60/203.1; 89/8; 376/319 [IMAGE AVAILABLE]

3. 4,879,090, Nov. 7, 1989, Split **vaned** nuclear fuel assembly grid; Patrick A. Perrotti, et al., 376/462, 439, 442; 976/DIG.60, DIG.78 [IMAGE AVAILABLE]

4. 4,844,861, Jul. 4, 1989, Fuel assembly for **nuclear** **reactors**;; Joseph Leclercq, 376/439, 438, 440, 442, 462; 976/DIG.59 [IMAGE AVAILABLE]

5. 4,844,860, Jul. 4, 1989, Support grid with integral **vanes**;; Stephen C. Hatfield, 376/439; 976/DIG.60, DIG.76, DIG.78 [IMAGE AVAILABLE]

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U.S. Patent & Trademark Office

P0028

6. 3,844,888, Oct. 29, 1974, HELICAL FLOW **DEFLECTOR** CONE FOR FUEL ELEMENT ASSEMBLIES; John N. Calvin, 376/439; 239/463, 501; 976/DIG.60 [IMAGE AVAILABLE]

=> d l14 1-12

1. 5,143,691, Sep. 1, 1992, Fuel assembly with flow tripper for a

boiling water reactor; Hans-Ulrich Lippert, et al., 376/443, 444, 439,
444 [IMAGE AVAILABLE]

2. 5,139,736, Aug. 18, 1992, Fuel assembly support grid; William J. Bryan, 376/442, 438, 439, 462 [IMAGE AVAILABLE]

3. 5,020,411, Jun. 4, 1991, Mobile assault logistic kinematic engagement device; Larry Rowan, 89/1.11; 60/203.1; 89/8; 376/319 [IMAGE AVAILABLE]

4. 4,879,090, Nov. 7, 1989, Split vaned nuclear fuel assembly grid; Patrick A. Perrotti, et al., 376/462, 439, 442; 976/DIG.60, DIG.78 [IMAGE AVAILABLE]

5. 4,863,680, Sep. 5, 1989, Fuel assembly; Koichi Sakurada, et al., 376/444, 438; 976/DIG.60, DIG.64 [IMAGE AVAILABLE]

6. 4,844,861, Jul. 4, 1989, Fuel assembly for **nuclear** **reactors**;
Joseph Leclercq, 376/439, 438, 440, 442, 462; 976/DIG.59 [IMAGE AVAILABLE]

7. 4,844,860, Jul. 4, 1989, Support grid with integral vanes; Stephen C. Hatfield, 376/439; 976/DIG.60, DIG.76, DIG.78 [IMAGE AVAILABLE]

20 NOV 92 16:53:01 U.S. Patent & Trademark Office P0029

8. 4,832,906, May 23, 1989, Fuel assembly; Motoo Aoyama, et al., 376/419, 435, 455, 903, 917; 976/DIG.64 [IMAGE AVAILABLE]

9. 4,708,845, Nov. 24, 1987, BWR fuel assembly with improved **spacer** and fuel bundle design for enhanced thermal-hydraulic performance; Claude M. Mildrum, et al., 376/435, 349, 414, 419, 434, 438, 442, 443; 976/DIG.64, DIG.78 [IMAGE AVAILABLE]

10. 4,204,909, May 27, 1980, Temperature sensitive self-actuated scram mechanism; Nicholas Giuggio, et al., 376/247, 327, 336; 976/DIG.147 [IMAGE AVAILABLE]

11. 4,113,563, Sep. 12, 1978, Fuel arrangement for high temperature gas cooled reactor; Joseph M. Tobin, 376/427, 352, 396; 976/DIG.7, DIG.25 [IMAGE AVAILABLE]

12. 3,844,888, Oct. 29, 1974, HELICAL FLOW DEFLECTOR CONE FOR FUEL ELEMENT ASSEMBLIES; John N. Calvin, 376/439; 239/463, 501; 976/DIG.60 [IMAGE AVAILABLE]

=>

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s (nuclear(a)reactor#)
    40009 NUCLEAR
    79984 REACTOR#
L1      8275 (NUCLEAR(A) REACTOR#)

=> s l1 and (two(a)phase# or boiling(a)water(a)reactor# or bwr)
    1253664 TWO
    319960 PHASE#
    28472 TWO(A) PHASE#
    109903 BOILING
    510855 WATER
    79984 REACTOR#
    924 BOILING(A) WATER(A) REACTOR#
    455 BWR
L2      1002 L1 AND (TWO(A) PHASE# OR BOILING(A) WATER(A) REACTOR# OR BWR)

=> s l2 and (part(p)length(p)rod# or partial(p)length(p)rod# or short?(p)rod#)
    922305 PART
    673493 LENGTH
    282830 ROD#
    7218 PART(P) LENGTH(P) ROD#
    274248 PARTIAL
    673493 LENGTH
    282830 ROD#
18:17:44 COPY AND CLEAR PAGE, PLEASE
    572 PARTIAL(P) LENGTH(P) ROD#
    578823 SHORT?
    282830 ROD#
    27580 SHORT?(P) ROD#
L3      170 L2 AND (PART(P) LENGTH(P) ROD# OR PARTIAL(P) LENGTH(P) ROD# OR
SHO      RT?(P) ROD#)

=> s l3 and (pressur?)
    707928 PRESSUR?
L4      148 L3 AND (PRESSUR?)

=> s l4 and (spacer# or spacer(a)grid#)
    84588 SPACER#
    67135 SPACER
    41491 GRID#
    306 SPACER(A) GRID#
L5      59 L4 AND (SPACER# OR SPACER(A) GRID#)

=> s l5 and (first(p)spacer# and second(p)spacer#)
    1164444 FIRST
    84588 SPACER#
    19057 FIRST(P) SPACER#
    1057979 SECOND
    84588 SPACER#
18:34:29 COPY AND CLEAR PAGE, PLEASE
    17901 SECOND(P) SPACER#
L6      10 L5 AND (FIRST(P) SPACER# AND SECOND(P) SPACER#)

=> d l6 1-10

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